Catalyzing Knowledge Transfer in Innovation Ecosystems through Contests

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Abstract

Open innovation practices are gaining traction. Hence, the relevance of measures for engaging and managing heterogeneous groups of distributed complementors is rising. This mixed-method case study defines a pilot demonstration of emergent technology as an innovation ecosystem and utilizes a knowledge transfer lens to explore the impact of an open innovation contest. The contribution to the IS research stream is threefold. Firstly, the paper portrays that open innovation contests can spark coupled open innovation and facilitate innovation management, without lowering the generative capability. Secondly, it explains these gains by concluding that contests can catalyze cross-border knowledge transfer within innovation ecosystems. Thirdly, the paper moreover proposes that additional innovation deployment measures are needed in order for sustaining established relations and for aiding the implementation of innovation ideas beyond the contests.

Keywords

Open Innovation Contest, Open Innovation, Innovation Ecosystem, Knowledge Transfer

Introduction

Disruptive technologies and new market conditions are transforming traditional models for business and organization (e.g. Dahlander & Gann 2010). In the lights of this, open innovation has arisen as a widely favorable path for achieving sustainable growth (e.g. Gassman et al. 2010). Proponents for the paradigm shift foresee enhanced incremental innovation (Murray & O'Mahony 2007) and discovery of radical solutions (Lakhani et al. 2006) as well as greater commercialization (Chesbrough & Rosenbloom 2002), compared to conventional practices.

However, opening up innovation processes is associated with a few significant trade-offs (West 2003). Extant literature recognizes fundamental give-and-takes between eased adoption (Shapiro & Varian 1999) and impeded value appropriation ability (David & Greenstein 1990) as well as between the benefits of combining the efforts of a large and diverse pool of complementary actors (Chesbrough 2006a), and the inevitably increased coordination costs (Greenstein, 1993). Almirall and Casadesus-Masanell (2010) furthermore points out that open innovation strategies allow for discovery of innovations that would be hard to envision otherwise, but impedes the focal firm's ability to establish the innovation trajectory. Consequently, there is arguably a need for developing novel measures for managing open innovation that neither hamper the generative capability of the innovation ecosystem nor lower the attractiveness of participating in it. Hjalmarsson and Rudmark (2012) describe innovation contests as events in which external participants compete to implement the most firm and satisfying solution that adhere to organizational goals. This indicates that open innovation contests and associated resources might be used as means to delicately introduce and communicate suggested innovation trajectories to external parties, without restricting who can contribute to the innovation ecosystems or what they are aloud to do.

Chesbrough (2006b) lists the abundant underlying knowledge landscape as an underpinning notion for the open innovation paradigm, proposing that useful knowledge is widely distributed throughout the innovation ecosystem, e.g. throughout the “collaborative arrangements through which firms combine their individual offerings into a coherent, customer facing solution” (Adner 2006, p.2). Roux et al. (2006) moreover claim that sustainable ecosystem management relies on a diverse and multi-faceted knowledge system. Accordingly, this study uses knowledge transfer, e.g. "the process through which one unit is affected by the experience of another" (Argote and Ingram 2000, p.156) as a point of departure when, by the means of a case study, examining how an open innovation contest impacts an innovation ecosystem. More specifically, the paper addresses the following research questions:

How is knowledge transfer within innovation ecosystems affected by open innovation contests? What are the consequences for throughput and manageability?

In the following, the theoretical framework is first laid out prior to an in-depth description of the studied case and a brief overview of the research approach. Thereafter, the impact on knowledge transfer is portrayed followed by a discussion on the consequences for throughput and manageability. Lastly, the paper suggests topics for future research and presents conclusions.

Theoretical Framework

Emery and Trist (1960) coined the term socio-technical systems (STS) to explain the interaction between people and technology at work places. Later contributions have enhanced the framework to include IT (Mathews 1997), human-centered design and systems engineering (Baxter and Sommerville, 2011) as well as formal regulations, social norms and sense making to further define how people and technology interact (Geels 2004). This study adopts the STS approach when structuring its theoretical framework.

The underlying premise of the open innovation paradigm is that valuable ideas can stem from either inside or outside the organization and reach the market through either inside or outside paths as well (Chesbrough 2006b). This idea challenges traditional innovation practices by placing external ideas and market on the same level of importance as internal. In short, Chesbrough (2006b, p.2) defines open innovation as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively”.

Three types of openness are explored by Enkel et al. (2009): *outside-in, inside-out* and *coupled*. In the outside-in form, the initiator of open innovation unlocks its organizational borders to make greater use of external ideas and technologies. This means that the initiator welcomes external contributions (e.g. customer ideas), but thereafter decides which ideas to pursue. The second form of openness, inside-out, refers to when the initiator unlocks its own resources so external actors can use them. These actors can then use the resources to develop products and services without adhering to the organizational and/or individual goals of the initiator (Enkel et al. 2009). The third form is labelled coupled. It is a combination of the outside-in and inside-out processes, often characterized by the formation of enduring alliances with complementary external partners (e.g. Gassman & Enkel 2004, Feller et al. 2010).

As a first step, this study proposes a theoretical framework for studying coupled open innovation. Inspired by Dubin (1970) and Boström and Heinen (1977), the framework describes a socio-technical ecosystem for open innovation, including the boundary of the ecosystem and the interrelations between its core components (see Figure 1). The framework does not claim to encompass all stakeholders or perspectives on open innovation, but is merely aimed at describing the transition from traditional to open processes.

Innovation Ecosystems

As innovation practices become increasingly open, more actors get involved. Thus, the relevance of viewing innovation through an ecosystem lens is rising (Adner 2006). The key point of the perspective, according to Adner and Kapoor (2010) is that it is not enough for product or service providers to consider whether and how their product or service will successfully resolve its internal innovation challenges. A competitive and continuous value offering requires that all their partners resolve their innovation challenges as well.

An innovation ecosystem typically has a *focal product* that the system revolves around and a *focal consortium* that governs that product (Adner & Kapoor 2010). However, the ecosystem comprises upstream suppliers, and downstream buyers and complementors as well. These actors are in the theoretical framework for this study labeled *distributed complementors*, while their contributions to the ecosystem are called *distributed complements*.

Coordination among the actors is characterized by simultaneous cooperation and competition that follows the new 'rules' of the game (Adner & Kapoor 2010). Due to increasingly "coopetitive" relationships, these ecosystems are ambiguous (Lyytinen et al. 2008) and recent research suggests that participating in such complex systems is likely to re-define roles and tasks (Kwak et al. 2009). Simply put, as the stakes grow higher the positions and contributions of the participating organizations become increasingly uncertain. Accordingly, Hjalmarsson and Rudmark (2012) identify that coordination is required in order to facilitate and control the distributed innovations into contributing to the common trajectory of the innovation ecosystem. A strategy for enabling coordination without introducing hampering regulations or governance procedures is to introduce an intermediary *knowledge broker* (e.g. Almirall & Wareham 2008, Frey et al. 2011), which act to connect sources of ideas with potential implementations (Winch & Courtney 2007). An example of a process acting as such a broker, that has gained traction lately, is the open innovation contest.

Open Innovation Contests

Contests have become a popular form to propel open innovation and boost creativity beyond organizational boundaries to develop digital services based on open digital resources (Hjalmarsson et al. 2014). They are frequently used during early stages of innovation to stimulate creation of ideas (Bullinger & Moeslein 2010) and prototypes (Osimo et al. 2012). Different types of contest formats have emerged for this purpose: e.g. idea competition (Piller and Walcher 2006), community based innovation (Füller et al. 2006) and online innovation contests (Bullinger and Moeslein 2010). Hjalmarsson and Rudmark (2012) present sets of design elements for organizers to systematically setup contests that catalyze open innovation in innovation ecosystems. Juell-Skielse et al. (2014) moreover acknowledge the value of a structural approach with design elements to organize contests, however argue that a mindful scheme of the process that follows the contests must be included.

Beyond catalyzing open innovation and attracting new complementors, contests could also be used as a process for ensuring that distributed complements are aligned with the innovation trajectory of the innovation ecosystem (Hjalmarsson & Rudmark 2012). Contests' challenges, rules, prizes and formats as well as the resources that are made available for the participants can steer developed complements towards the innovation path, envisioned by the focal consortium. A prerequisite for this type of innovation management is cross-border *knowledge transfer* (Hamburg 2011), i.e. communication between the focal consortium and the distributed complementors. Facilitating knowledge transfer between stakeholders is thus a key task for open innovation contests, acting as knowledge brokers in innovation ecosystems.

Knowledge Transfer

Cross-border knowledge transfer can be interpreted as the process that enables one actor in the innovation ecosystem to benefit from either explicit or tacit knowledge, held collectively or individually by other actors (Hamburg 2011). While explicit knowledge can be coded in writing or symbols, tacit knowledge is acquired by and stored within individuals and cannot be transferred or traded as a separate entity (Polayni 1966). Blackler (1995) moreover introduces encoded knowledge as a specific kind of explicit knowledge. With the growing organizational impact of information communication technologies this term now encompasses digital knowledge such as websites and databases (Warhurst 2013).

As knowledge generation and transfer are essential for individual actors' competitive advantage (Osterloh & Frey 2000), cross-border knowledge transfer is crucial for the overall sustainability of the innovation ecosystem. Accordingly, Roux et al. (2006, p.1) recognize that ecosystem management depends on the "acquisition and use of integrated systems of knowledge that continuously replace outmoded techniques as our understanding evolves". Osterloh and Frey (2000) pinpoint the transfer of tacit knowledge as particularly crucial source of competitive advantage since it is difficult to imitate. Thus, intermediate knowledge brokers should be capable of handling this type.

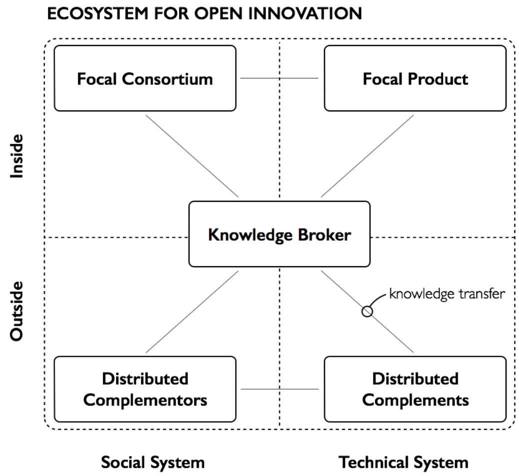

Figure 1. Theoretical Framework

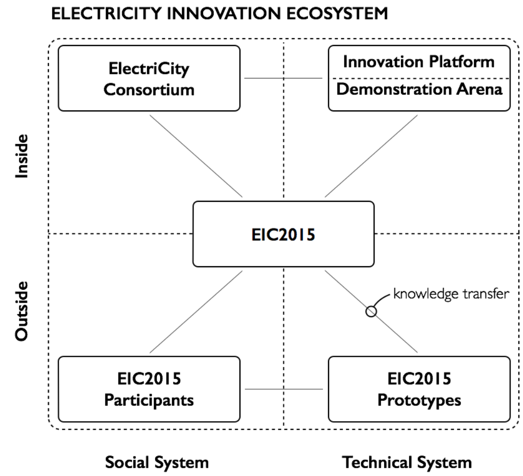

Figure 2. Case Description

Case Description

ElectriCity is a three-year pilot demonstration of next-generation public transportation systems in Gothenburg, Sweden (goteborgelectricity.se), starting in June 2015. The underlying purpose of the pilot is to contribute to the goal of doubling the modal share of public transport in Sweden (Swedish Public Transport Authority, 2014). This paper defines ElectriCity as a socio-technical ecosystem for coupled open innovation and visualizes it as in figure 2.

The *focal product* of the innovation ecosystem is ElectriCity itself. ElectriCity consists of two parts: The demonstration arena, which is the physical representation of the product, and the innovation platform, which is the digital representation of the product.

ElectriCity Demonstration Arena

Three electric concept buses and seven pre-production models of plug-in hybrid buses form the core of the demonstration arena ElectriCity in Gothenburg, Sweden. The buses are demonstrated along a 9,5 km long inner-city route over a period of three years.

Additionally to the novel buses, ElectriCity furthermore includes demonstration of several other products and services meant to increase the efficiency, sustainability and attractiveness of tomorrow's public transport solution such as a new depot concept, zone management control and six new bus stops, including one indoor bus stop and one soundproofed bus stop. The bus route is moreover surrounded by lounges, cafés and exhibitions.

ElectriCity Innovation Platform

Information about the demonstration arena, and its components, has been made public through the ElectriCity Innovation Platform (platform.goteborgelectricity.se). The innovation platform offers background information about the demonstration arena in a digital library. This includes technical specifications of the buses, photos and drawings of the bus stops and information about the charging stations' energy consumptions, among other things.

A novel application-programming interface (API) that assembles real time data from the buses and bus stops is also made available via the innovation platform. Access to the API requires registration, but is open for all. Data points include the position of the bus, whether the stop button has been pressed and information about the wireless Internet connection, among other things.

ElectriCity Consortium

The *focal consortium* of the innovation ecosystem is the consortium behind ElectriCity. A global bus company is the main initiator, and is responsible for development of buses and transport solutions. However, the consortium includes two public institutions, the regional public transport authority, a public transport operator, an energy company, two local business parks, three property managers and an non governmental organization that works to strengthen trade and industry in the region as well as a University. The implementation is furthermore co-founded by two governmentally controlled agencies.

ElectriCity Innovation Challenge 2015

The proposed *knowledge broker* in the innovation ecosystem is ElectriCity Innovation Challenge 2015 (EIC2015). It was an open innovation contest aimed at surging interest and involvement, catalyzing coupled open innovation, and testing the feasibility of the innovation platform. The goal was to facilitate development of prototypes of products and services with potential to increase the attractiveness of public transport (Smith and Burden et al. 2016).

The EIC2015 website (challenge.goteborgelectricity.se) was launched in June 2015. 261 participants divided upon 64 teams were recruited. A 24-hour concept generation factory in September marked the beginning of the contest. During this event, 214 participants received supervision and feedback while developing 50 concepts within the scope of the contest challenge. During the following months, four development workshops were arranged. Participants had through these opportunities to interact with and get feedback from representatives of the consortium. In the end, 48 teams participated in a final exhibition and pitched their prototypes for an expert jury. Three contest category winners and one main winner were selected. They won consultation and an opportunity to discuss demonstration, realization and partnership with decision makers within the ElectriCity consortium. The participants are for the sake of this study seen as *distributed complementors*, and their prototypes as *distributed complements*.

Research Design

This study has utilized a case study approach (Baxter & Jack 2008), this allows for investigating a phenomenon in depth, especially when the unit of analysis is exploratory and holistic in its character (Benbasat et al. 1987). Table 1 summarizes the case study process, developed based on the guidelines provided in Yin (1994; 2012). The study was moreover permeated by close relationships and continuous dialogue with both the participants and representatives from the consortium throughout the process. Hence, participant observation (Baskerville & Wood-Harper 1998) was the key data collection technique, in the mixed data collection and analysis design that created the rigorous documentation of and holistic understanding for the case. The analysis of the observations was thus complemented with qualitative and quantitative analyses of data from semi-structured interviews, web surveys and data logs.

	Prior to EIC2015		**During EIC2015**			**After EIC2015**	
When	Feb to Aug 2015		Aug to Nov 2015			Nov 15 to Jan 16	
Activity	Framework development	Definition of case	Collection of subjective data	Collection of objective data	Quality evaluation	Follow-up	Data Analysis
Primary Methods	Structured literature review	Stakeholder mapping & semi-structured interviews	Web surveys & open-ended interviews	API-log	Jury assessment & observation	Participant-observation & semi-structured interviews	Deductive qualitative & descriptive quantitative analysis
Output	Theoretical framework & research process	Case description & knowledge transfer baseline	Data on tacit knowledge transfer	Data on explicit knowledge transfer	Data on encoded knowledge transfer	Data on continuity of knowledge transfer	Conclusions

Table 1. Research Process

Results

Web Surveys

At the end of the concept generation factory, all the 50 teams the teams that submitted concepts also filled in a web survey aimed at mapping the characteristics of the participants as well as their motives to participate. The survey results show that 43 of the teams (86%) competed with ideas, initiated due to the contest. The other seven teams had concepts that they either wanted to evolve (five teams) or promote through the contest (two teams). Major motives for participating in the contest was to develop new skills, to have fun and to network, apart from fulfilling given tasks. Recurrent self-assessed strengths among the participants included wealth of ideas, enthusiasm and technical knowledge, while the most frequently mentioned weaknesses were lack of experience and domain knowledge.

A majority of the participants used public transport frequently, implying that they had first hand experience of public transport user issues. 36 teams (72%) claimed to travel on a daily basis while 13 teams (26%) did so at least once a week. Only one team travelled less frequently. The teams moreover reported a medium of 1.8 on a five-point Likert-scale regarding their domain knowledge of public transportation and 3.7 for their understanding of the needs of public transportation users.

Prior to the final exhibition, in parallel to submitting prototypes, all the 48 teams that lasted to the end of the contest also filled in another web survey; this time aimed capturing their experiences of the contest. These results portray that the contest succeeded in enhancing the participants' interest for ElectriCity (4.0 on a 5-point Likert scale) and enabled them to develop competence (4.2 out of 5). Compared to the results from the concept survey, the domain knowledge of public transportation went up 0.2 points (to 2.0), while the knowledge regarding the needs of public transportation users went down 0.5 points (to 3.2). Both changes indicate that the participants' knowledge has been affected by their participation in the contest. Those teams that used the API stated that the perceived value of it was 4.1. When asked what the best aspect of participating in the contest was, the top answer was the interactions with the consortium. The positive reception as well as the scale and the thorough nature of the contest also amazed them. Technical problems with the innovation platform, the contest procedure and lack of information were the three most commonly experienced impediments.

Regarding future plans, nine teams (19%) stated that they would not continue working on their prototype while 29 teams (61%) stated they would, see Table 2. Nine teams opted for the "Other" option. Their comments show that their future commitment depended on the interest from the consortium.

Post contest plans	**Teams**
Continue working on our prototype	9 (19%)
Start a company	2 (4%)
Work on our spare time	9 (19%)
Continue through our current employment	18 (38%)
Other	9 (19%)

Table 2. Post-contest Plans

A few weeks after the final exhibition, a web survey was sent to 45 representatives for the ElectriCity consortium that also had been involved in the design and implementation of EIC2015. It received 23 responses. The survey results first and foremost display that the representatives on average appreciated being a part of the contest (4.5 on a 5-point Likert scale), that the interactions with the contest participants were valuable (3.7 of 5), and that the contest was an useful experience overall (4.0 of 5). Moreover, the results show that the contest enabled the consortium to develop competence (3.5 out of 5), and to augment distributed innovators interest in contributing to the innovation ecosystem (3.7 out of 5).

The three winning contributions were perceived as appropriately addressing the consortium's challenges and a majority of the organizations planned to contribute to the winners continued work. Lastly, the respondents on average agreed on that the contest succeeded in surging interest and involvement, catalyzing distributed innovation, and testing the feasibility of the innovation platform.

Jury Assessment

The jury's assessment, that was based on both live presentations and the submitted prototypes, shows that 42 teams (87.5%) had developed prototypes that to some degree addressed the purpose of the contest. 36 teams (75%) had submitted prototypes relevant for the Electricity context and 31 teams (65%) had innovative contributions. The three winners had developed: a) an app that informs passengers about upcoming events at the next bus stop, b) a bus stop that uses lightning to both create a safer atmosphere and to inform passengers and bus drivers, and c) an app for supervising children travelling on their own.

Post-contest Meet-up

Two months after the contest, the 15 teams that had received the highest praise from the jury and had stated that they wanted to continue developing their prototypes after the contest were invited to a meet-up with representatives from the ElectriCity consortium. Four of the eleven teams that showed up had concrete examples on how they had continued to work on their prototypes. The seven teams who had not made any progression stated that the main reasons were no time for development, difficulty to find interested consortium partners for collaboration, lack of motivation and lack of funding.

API Log

The API log was analyzed for descriptive statistics. The outcome is shown in Table 3. October 2015 stands for the majority of the API activity, both in terms of the number of teams (97%) and number of calls (96%). With the exception of one team, all teams using the API were active in October, the exception being a team who made one (1) call in September.

	2015-09	**2015-10**	**2015-11**	**2015-12**	**2016-01**	**Total**
Unique users (teams)	13	33	17	8	4	34
API Calls	805	578'925	18'528	2'158	1'318	601'734

Table 3. API Usage

Discussion

An overwhelming majority of the contest participants did not work on developing prototypes prior to the introduction of the contest. It is plausible that their low activity was partly due to the lack of insight into the ElectriCity consortium's concerns as well as into the specifics of the demonstration arena. Accordingly, their average domain knowledge was low, and their innovative capability was in general limited to their own experiences as users of public transport. Another effect of the lack of transparency was that their overall interest in contributing to the innovation ecosystem was low.

The contest participants then gained access to the tacit knowledge of the consortium upon the introduction of the contest. Their possibilities to understand and problematize public transport were also facilitated as the contest took them "behind the scenes". Moreover, the introduction of the innovation platform increased their access to explicit knowledge. In sum, their access to knowledge rose significantly, which increased their innovative capability without lowering their generative capability. The participants' interest in contributing to the innovation ecosystem was also enhanced. The contest furthermore helped the ElectriCity consortium in understanding the needs of the participants and the motivation for their prototypes. Technical adjustments for the innovation platform were implemented as a direct consequence of feedback received during the contest.

After the contest, the cross-border knowledge transfer died out quickly. Very few of the participants continued interacting with the consortium and even fewer continued developing their prototypes. The participants did not receive the incentives needed. As a consequence, the consortium stopped learning about and caring for the participants and their prototypes. The knowledge transfer within the innovation ecosystem prior to, during and after the contest can be visualized as in figure 3.

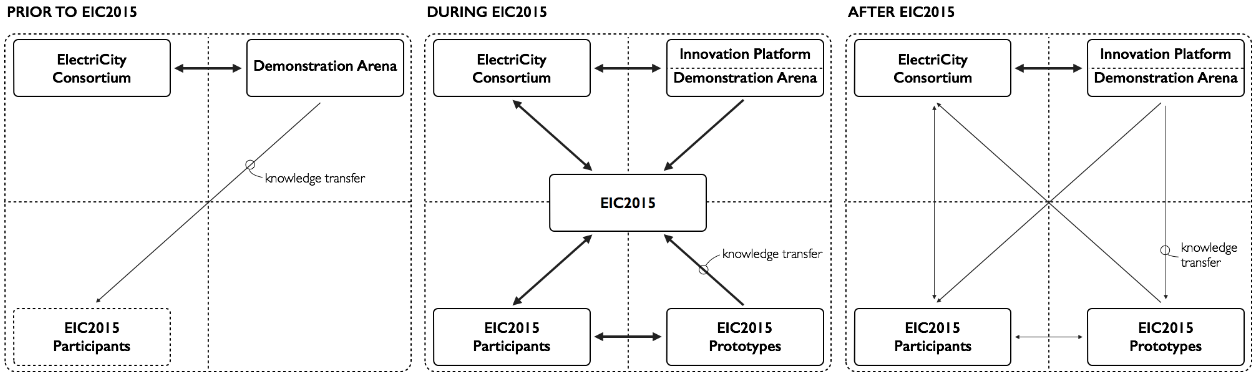

Figure 3. Impact on Knowledge Transfer

In summary, EIC2015 catalyzed bidirectional transfer of both explicit and tacit knowledge. This ignited coupled open innovation, which is shown by the overwhelming activity during the contest and the assessment of 31 submitted prototypes as innovative contributions. As supported by the overall positive jury assessment and the diversity among the submissions, the contest was moreover a suitable tool for disseminating the envisioned innovation trajectory to distributed complementors without limiting their potential solution space or their interest in participating in the innovation ecosystem. However, the spark lit by the contest did not generate sustained cross-border knowledge transfer. None of the generated prototypes are yet implemented and the processes to do so are either slow moving or have halted. Moreover, the relations between focal and distributed actors are rapidly deteriorating. This implies that additional innovation deployment measures are needed in order to ensure continuation of cross-border knowledge transfer and substantiate coupled development after the contest.

This study reinforce earlier remarks that organizers of open innovation contests driven by the aim to stimulate coupled open innovation, must in their design of the process not only focus on the contest phase, but also carefully develop a thorough scheme for deployment (e.g. Juell-Skielse et al. 2014). It furthermore suggests that in order to reduce the impact of barriers hindering post-contest market entry (Hjalmarsson et al. 2015), this process should facilitate continuous and structured knowledge transfer between focal and distributed actors. As proposed by Smith and Ofe et al. (2016), distributed complementors experience several of their key sustainability problems in later stages of their products' and services' lifecycles, such as being dependent on the focal consortium without possibilities to impose requirements on them. Measures that aid cooperation with the focal consortium after the contest, including exchange of services, knowledge and resources, could improve opportunities to create enhanced value offerings for end-users, as well as the likelihood that third party services reach the end-user market.

The study has several limitations. First and foremost, it is a single case study, highly influenced by the composition of stakeholders, type of focal product and design of the open innovation contest. Not all open innovation contests act as knowledge brokers, or are parts of ecosystems for open innovation. Furthermore, the study solely focuses on the knowledge transfer task. Open innovation contests have additional capabilities, while other tools and processes also can be used as support for knowledge transfer (c.f. Hamburg 2011). Additional cases are needed in order to establish the generalizability of the findings and for widening the understanding. The authors envisage that the results from this study will constitute a point of departure for additional studies that analyze how cross-border knowledge is catalyzed via contests and innovation deployment is promoted after the contests.

Conclusion

The introduction of open innovation contests can catalyze bidirectional cross-border knowledge transfer between focal and distributed actors in innovation ecosystems. It can also enhance their access to knowledge about both focal and complementary products. Thus, open innovation contests constitute capability to ignite coupled open innovation and to ease focal consortiums' management of the innovation trajectories, without hampering the generative capabilities of the innovation ecosystems. However, additional innovation deployment measures are needed in order for sustaining established relations and for aiding the implementation of innovation ideas beyond the contests.

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